CHAPTER 7.
Disparity Analysis for GDOT Contracts

Chapter 6 reported the share of GDOT contract dollars that went to MBE/WBEs. Disparity analysis compares MBE/WBE utilization to the availability benchmarks for each racial/ethnic/gender group introduced in Chapter 5. The analysis identifies whether or not minority- and women-owned firms were underutilized in GDOT contracts.

Chapter 7 presents BBC's disparity analysis in five parts:

A. Overview of disparity analysis methodology;

B. Overall disparity results for GDOT contracts;

C. Results for FHWA-funded and state-funded contracts;

D. Results for local agency construction contracts;

E. Analysis of statistical significance; and

F. Summary.

A. Overview of Disparity Analysis Methodology

BBC compared actual utilization of MBE/WBEs (as a percentage of total contract dollars) with the share of contract dollars that might be expected to go to MBE/WBEs based on BBC's availability analysis. The following discussion also refers to "expected share of contract dollars" as a "benchmark" or simply "availability." BBC calculated a unique benchmark for each MBE/WBE group, for each set of GDOT contracts examined.

Both the actual utilization and the benchmark are expressed as a percentage of the dollars involved in those contracts. They are expressed in terms that are directly comparable (e.g., 5% actual utilization compared with a benchmark of 4%).

To help compare results between groups or across sets of contracts, BBC calculates a disparity index, as described in Figure 7-1. An index of "100"

Figure 7-1.
Calculation of disparity indices

The disparity index provides a straightforward way of assessing how closely actual utilization of an MBE/WBE group matches what might be expected given the relative availability of that MBE/WBE group for the work involved in a specific set of contracts. An index of "100" indicates an exact match between actual and expected utilization for that group (also referred to as "parity"). In BBC's disparity analysis, a disparity index is calculated for each MBE/WBE group for each set of contracts examined. One can directly compare an index for one group to another group, and between sets of contracts.

BBC calculates the disparity index for a particular group through the following formula:

$$\frac{\text{\% actual utilization}}{\text{\% availability}} \times 100$$

For example, if actual utilization of WBEs in a set of GDOT contracts was 2% and the availability benchmark was 10% for those contracts, the index would be 2%÷10%, which is then multiplied by 100 to derive an index of 20. In this example, WBEs would have received 20 cents for every dollar expected to go to WBEs based on the availability benchmark.

indicates a level of actual utilization that exactly matches what might be expected from the availability analysis. An index less than 100 may indicate a disparity between utilization and availability.

Example of a disparity analysis table. Disparity results presented in Chapters 7 and 8 are based on detailed disparity tables in Appendix K. Each table reports results for a different set of GDOT contracts. One of the disparity tables in Appendix K, Figure K-2, provides results for all contracts examined in the disparity analysis — combined FHWA-funded and state-funded construction and engineering-related contracts that GDOT awarded for 2009–June 2011.

Appendix K contains similar tables for different sets of contracts, including those that separate results for FHWA- and state-funded contracts; prime contracts and subcontracts; construction and engineering-related contracts; and small contracts. Note that the parameters for the set of contracts being examined are reported in the heading of each table in Appendix K.

Because each of the Appendix K disparity tables uses the same calculations and format for presenting results, a review of Figure K-2 provides an introduction to each of these tables. Figure K-2 from Appendix K is replicated as Figure 7-2 on the following page.

Utilization. Each of the disparity tables includes the same columns and rows:

- Column (a) notes the number of prime contracts and subcontracts in the set of contracting data under examination (in Figure 7-2, 4,838 total contracts and subcontracts).
- Column (b) identifies the dollars examined in the set of contract elements. Dollars are reported in thousands. This disparity table examines contract dollars totaling approximately $2 billion. Because "prime contract dollars" refers to the dollars retained by the prime contractor after deducting subcontract dollars, the combined prime/subcontract analyses equals the total contract amounts.
- Column (c) provides utilization dollars by group after pro-rating any money going to firms identified as MBEs for which specific race/ethnicity information was not available. In the GDOT disparity analysis, there were no contract elements for which race/ethnicity of an MBE firm could not be determined.
- Column (d) presents relative utilization on a percentage basis. Each percentage in column (d) is calculated by dividing dollars going to a group in column (c) by the total dollars in the set of contracts or subcontracts as shown in row (1) of column (c).

Figure 7-2 includes separate rows for each firm type:

- "All firms" in row (1) pertains to combined majority-, minority- and women-owned firms.
- Row (2) provides results for all minority- and women-owned firms, whether or not they are certified (as MBEs, WBEs or DBEs). As shown in Figure 7-2, minority- and women-owned firms received 12.4 percent of the dollars on GDOT construction and engineering-related contracts from 2009 through June 2011.
- Row (3) pertains to "WBEs," which are white women-owned firms.
- Row (4) pertains to "MBEs," or all minority-owned firms.

Figure 7-2.
MBE/WBE utilization, availability and disparity analysis for prime contracts/subcontracts on GDOT FHWA- and state-funded funded construction and engineering-related contracts, 2009–June 2011

Firm Type	(a) Number of contracts (subcontracts)	(b) Total dollars (thousands)	(c) Total dollars after Unknown MBE allocation (thousands)*	(d) Actual utilization (column c / column c, row1) %	(e) Utilization benchmark (availability) %	(f) Difference (column d - column e) %	(g) Disparity index (d / e) x 100
(1) All firms	4,838	$1,987,419	$1,987,419				
(2) MBE/WBE	1,910	$246,350	$246,350	12.4	22.0	-9.6	56.3
(3) WBE	1,383	$166,616	$166,616	8.4	5.2	3.2	161.9
(4) MBE	527	$79,734	$79,734	4.0	16.8	-12.8	23.8
(5) African American-owned	397	$47,959	$47,959	2.4	14.1	-11.7	17.1
(6) Asian-Pacific American-owned	4	$122	$122	0.0	1.5	-1.5	0.4
(7) Subcontinent Asian American-owned	27	$7,318	$7,318	0.4	0.6	-0.2	64.4
(8) Hispanic American-owned	81	$21,341	$21,341	1.1	0.5	0.6	200+
(9) Native American-owned	18	$2,995	$2,995	0.2	0.1	0.0	115.6
(10) Unknown MBE	0	$0					
(11) DBE-certified	1,528	$192,451	$192,451	9.7			
(12) Woman-owned DBE	1,018	$117,174	$117,174	5.9			
(13) Minority-owned DBE	510	$75,277	$75,277	3.8			
(14) African American-owned DBE	387	$47,320	$47,320	2.4			
(15) Asian-Pacific American-owned DBE	3	$97	$97	0.0			
(16) Subcontinent Asian American-owned DBE	27	$7,318	$7,318	0.4			
(17) Hispanic American-owned DBE	75	$17,548	$17,548	0.9			
(18) Native American-owned DBE	18	$2,995	$2,995	0.2			
(19) Unknown DBE-MBE	0	$0					
(20) White male-owned DBE	0	$0	$0	0.0			
(21) Unknown DBE	0	$0					

Notes: Spreadsheet rounds numbers to nearest thousand dollars or tenth of one percent. WBE is white women-owned firms.

* Unknown MBE, Unknown DBE-MBE, and Unknown DBE dollars were allocated to MBE subgroups proportional to the known total dollars of those groups. For example, if total dollars of African American-owned firms (column b, row 5) accounted for 25 percent of total MBE dollars (column b, row 4), then 25 percent of column b, row 11 would be added to column b, row 5 and the sum would be shown in column c, row 5.

Source: BBC Research & Consulting Disparity Analysis.

Data for individual minority groups are shown in subsequent rows. Combined, those utilization dollars add up to the total for MBEs (in some cases, numbers may not perfectly add due to rounding).

The bottom half of Figure 7-2 reports utilization for firms that were certified as DBEs. BBC included a row for white male-owned DBEs, though no such DBE-certified firms appeared to have received GDOT contracts or subcontracts examined in this study. DBE utilization data reported in the bottom half of Figure 7-2 were prepared independently from GDOT's DBE participation reports and thus do not match DBE utilization presented in those reports (for a discussion of differences, see Chapter 6).

Figure 7-3.
Definition of "substantial disparity"

Some courts deem a disparity index below 80 as "substantial" and accepted as evidence of adverse impact. See e.g., *Rothe Development Corp v. U.S. Dept of Defense*, 545 F.3d 1023, 1041; *Eng'g Contractors Ass'n of South Florida, Inc. v. Metropolitan Dade County*, 122 F.3d at 914, 923 (11th Circuit 1997); *Concrete Works of Colo., Inc. v. City and County of Denver*, 36 F.3d 1513, 1524 (10th Cir. 1994). See Appendix A for additional discussion.

Utilization benchmark (availability). BBC developed estimates of the share of contract dollars that might be expected to go to each racial/ethnic/gender group given their relative availability for that work following the procedures described in Chapter 5. These availability results, represented as a percentage of contract dollars, provide a benchmark against which to compare relative utilization for a specific group. BBC separately calculated benchmarks for each group specific to each set of contracts examined in the study.

Column (e) of Figure 7-2 reports the availability benchmark for each group for GDOT's combined FHWA- and state-funded construction and engineering contracts. Based on the types of work involved in the prime contracts and subcontracts included in the Figure 7-2 analysis, plus the sizes of the contract elements when they were awarded, BBC estimated that 22.0 percent of GDOT contract dollars from 2009 through June 2011 might be expected to go to minority- and women-owned firms. This result can be found in row (2) of column (e) in Figure 7-2.

Differences between utilization and availability. The next step in analyzing whether there was a disparity between the relative utilization of a particular group and its relative availability is to subtract percentage utilization from percentage availability. For example, as reported in row (2), column (f) of Figure 7-2, MBE/WBE utilization was 9.6 percentage points below the benchmark based on MBE/WBE availability.

It is sometimes difficult to interpret absolute differences between percentage utilization and a benchmark, especially when the percentages are relatively small. Therefore, BBC also calculated a "disparity index," which divides percentage utilization by percentage availability and multiplies the result by 100. An index of "100" means that there is "parity" between relative utilization and availability for a particular group. An index below 100, particularly below 80, may indicate a substantial disparity, as discussed in Figure 7-3 above.

Column (g) provides the disparity index for each group. For example, the disparity index of 56 for MBE/WBEs shown in row (2) of column (g) means that utilization of MBE/WBEs in GDOT contracts during the study period was much lower than what would be expected from the availability analysis. BBC calculated this index by dividing 12.4 percent MBE/WBE utilization by 22.0 percent MBE/WBE availability, and then multiplying that result by 100.

The disparity index of 162 for WBEs shown in row (3) of column (g) indicates no underutilization of white women-owned firms.[1] Utilization of WBEs in GDOT contracts (8.4%) considerably exceeded what might be expected based on the availability analysis (5.2%).

Results when disparity indices are very large or when availability is zero. BBC applied the following rules when the disparity indices calculated were exceedingly large or could not be calculated because no firms were identified as available for the contracts under examination:

- When BBC's calculations showed a disparity index exceeding 200, BBC reported an index of "200+." This level of disparity index means that utilization was more than twice as much as might be expected based on the availability analysis.

- When there was no utilization and 0 percent availability for a particular group for a set of contracts, BBC reported "parity" between utilization and availability (indicated by a disparity index of "100").

- When BBC identified utilization for a group at 0 percent availability (which could occur for many reasons, including the fact that one or more utilized firms were out of business by the time of BBC's availability survey), BBC reported a disparity index of "200+."

The DBE utilization statistics at the bottom of Figure 7-2 are provided as reference. BBC did not conduct disparity analyses for just certified DBEs for the reasons described in Chapter 5.

B. Overall Disparity Results for GDOT Contracts

BBC created graphs from the detailed disparity tables to summarize results, as shown below.

Graphs showing disparity indices. BBC created graphs using disparity indices from column (g) in the Appendix K disparity tables. Figure 7-4 uses the information from Figure 7-2.

- The line down the center of the graph shows an index of 100, which indicates "parity" between utilization and availability for a particular group.
- Indices under 100 indicate a disparity between utilization and availability.
- The graph ends at a disparity index of 200 even though, in some cases, disparity indices in BBC's analysis exceed 200.
- For reference, a line is also drawn at an index of 80. Some courts use 80 as a threshold for what may indicate a substantial disparity, as discussed in Figure 7-3.

[1] Note that all percentages in the disparity tables were rounded to the nearest tenth of 1 percent after making all calculations. Percentages correctly add and subtract, even though the rounding may make actual sums appear to differ by one tenth of 1 percent. In addition, the disparity index is derived from the detailed data for percentage utilization and availability before any rounding.

Results for combined GDOT contracts. Figure 7-4 shows disparity indices for each MBE/WBE group when analyzing the combined FHWA- and state-funded GDOT contracts. Because these contract dollars are predominantly FHWA-funded contracts ($1.9 billion out of the $2.0 billion total), the Federal DBE Program had a strong influence on the utilization of certain MBE/WBE groups. Utilization of WBEs, Hispanic American-owned firms and Native American-owned businesses exceeded what might be expected based upon the availability analysis for those groups.

Even with the effect of the Federal DBE Program, however, utilization of African American-, Asian Pacific American- and Subcontinent Asian American-owned firms was substantially below what might be expected given the availability of these firms for GDOT prime contracts and subcontracts. For example, African American-owned firms received less than one-quarter of the dollars of GDOT contracts that might be expected from the availability of African American-owned businesses for that work. Disparity indices were also very low for Asian-Pacific American- and Subcontinent Asian American-owned firms. As noted in Figure 7-3, some courts deem a disparity index below 80 as "substantial."

Figure 7-4.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded GDOT construction and engineering-related contracts, 2009–June 2011

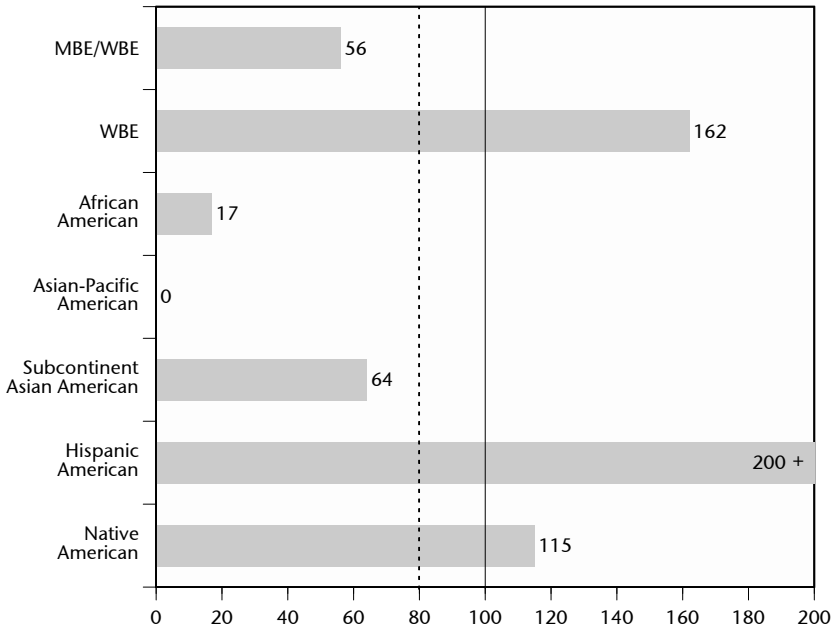
Note:

Number of contracts/subcontracts analyzed is 4,838.

For more detail, see Figure K-2 in Appendix K (which is the same as Figure 7-2).

Source:

BBC Research & Consulting.



C. Results for FHWA-funded and State-funded Contracts

BBC also separately analyzed results for FHWA-funded and state-funded contracts. The disparity analysis examined $1.9 billion of FHWA-funded contracts and $123 million in state-funded contracts awarded from 2009 through June 2011. Figure 7-5 compares disparity results for state-funded contracts (lighter bars in Figure 7-5) with the results for FHWA-funded contracts (darker bars in Figure 7-5). Figure 7-5 presents results for WBEs and for MBEs, combining individual MBE groups. Additional detail for MBE groups is provided in Figures K-3 and K-4 in Appendix K.

FHWA-funded contracts. MBE/WBE utilization on FHWA-funded contracts was 12.8 percent, which is less than the 21.7 percent that might be expected based on the availability analysis for FHWA-funded contracts. The disparity index for MBE/WBEs was 59.

As with combined GDOT contracts, utilization of WBEs on FHWA funded contracts exceeded availability (disparity index of 173). Utilization of African American-, Asian-Pacific American- and Subcontinent Asian American-owned firms was substantially below availability, even with application of DBE contract goals for many of these contracts. Utilization of Hispanic American- and Native American-owned firms exceeded availability. Figure K-3 in Appendix K provides detailed results.

State-funded contracts. MBE/WBE utilization on state-funded contracts (5.5%) was substantially less than what might be expected based upon the availability analysis for state-funded contracts (25.6%). The disparity index was 22. There were disparities for WBEs and for each MBE group, as shown in Figure 7-5. (See Figure K-4 in Appendix K for detailed results.) No contract goals applied to state-funded contracts.

Figure 7-5.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on GDOT FHWA- and state-funded construction and engineering-related contracts, 2009–June 2011

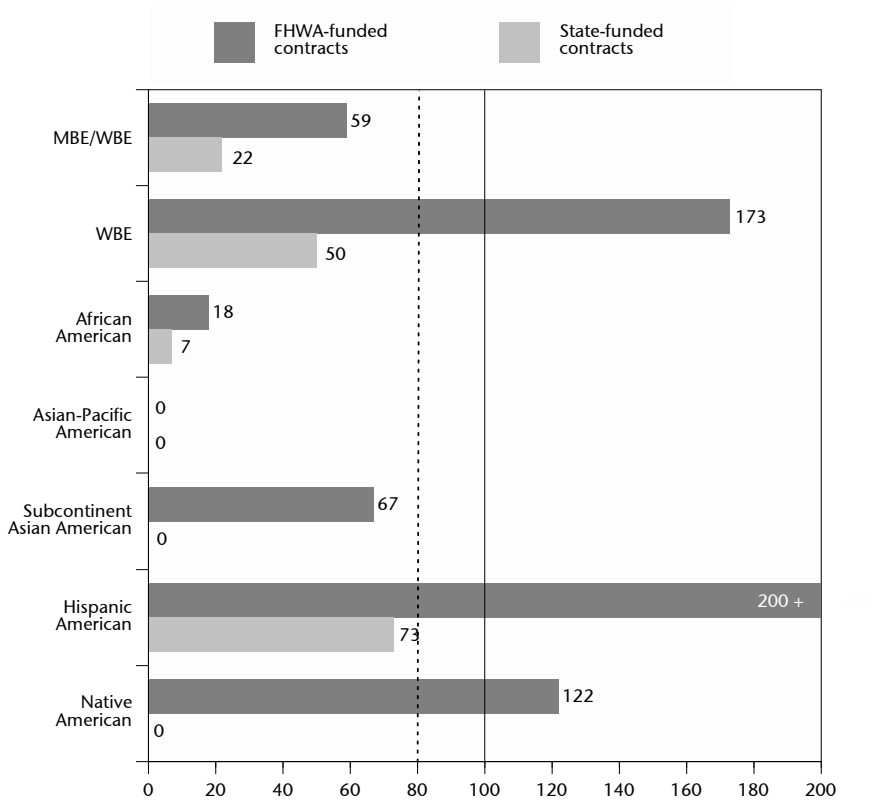
Note:

Number of contracts/subcontracts analyzed is 4,390 for FHWA-funded and 448 for state-funded contracts.

For more detail, see Figures K-3 and K-4 in Appendix K.

Source:

BBC Research & Consulting.



D. Results for Local Agency Construction Contracts

As discussed in Chapter 6, BBC was able to analyze utilization of MBE/WBEs for 14 of the 22 largest local agency construction contracts. FHWA-funded contracts accounted for more than 90 percent of the total dollars examined on these local agency awards.

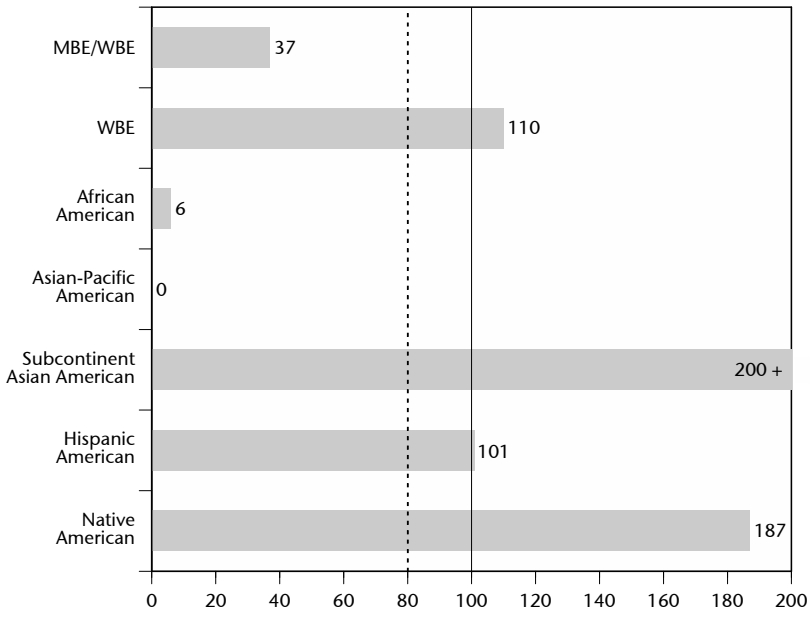
MBE/WBE utilization on local agency contracts (7.6%) was substantially below what might be expected from the availability analysis (20.5%). The resulting disparity index was 37.

Figure 7-6 presents disparity results by racial/ethnic/gender group. Similar to the results for GDOT's FHWA-funded contracts, there were no disparities for WBEs and Subcontinent Asian American-, Hispanic American- and Native American-owned firms. Utilization of African American- and Asian-Pacific American-owned firms was very low compared with the availability benchmarks for those groups.

Figure 7-6.
Disparity indices for MBE/WBE utilization as prime contractors and subcontractors on FHWA- and state-funded local agency construction contracts, 2009–June 2011

Note:
Number of contracts/subcontracts analyzed is 150.
For more detail, see Figure K-41 in Appendix K.

Source:
BBC Research & Consulting.



E. Analysis of Statistical Significance of Disparities

Statistical significance relates to the degree to which a researcher can reject "random chance" as a cause of an observed difference.

Data sampling. Random chance in data sampling is the factor that researchers consider most in determining statistical significance of results. However, BBC attempted to contact every firm in Georgia that Dun & Bradstreet (D&B) identified as doing business within relevant subindustries (as described in Chapter 5), mitigating many of the concerns associated with random chance in data sampling as it relates to BBC's availability analysis.

The utilization analysis also approaches a "population" of contracts. Therefore, any disparity found when comparing overall utilization with availability might be considered "statistically significant."

Random chance in prime contract and subcontract awards. There were many opportunities for minority- and women-owned firms to be awarded work in the sets of prime contracts and subcontracts that BBC analyzed. Some contract elements exceeded $1 million and others only involved a few thousand dollars.

Monte Carlo analysis is a useful tool to use for statistical significance testing because there were many individual chances at winning work with GDOT from 2009 through June 2011, each with a different monetary payoff. BBC's application of the Monte Carlo simulation is described in Figure 7-7.

BBC identified disparities overall for MBEs overall for both FHWA- and for state-funded contracts, and for WBEs for state-funded contracts — the Monte Carlo simulation focused on these results. Because of the limited number of state-funded prime contracts and subcontracts, and the relatively small benchmarks for all MBE groups except for African American-owned firms, the statistical significance of disparities was tested for MBEs overall.

Figure 7-7.
Application of Monte Carlo simulation

The Monte Carlo technique was applied as follows:

Each "run" of the Monte Carlo simulation starts by examining an individual contract element (a prime contract or subcontract).

BBC's availability database provides information on individual firms "available" for that contract element based on type of work, prime versus subcontract role, size of the prime contract or subcontract, and year the contract was awarded.

In each Monte Carlo simulation run, a firm is randomly selected to "receive" that contract element from the pool of available firms identified as available for that contract element. For example, the probability of a woman-owned firm receiving that contract element is equal to the number of women-owned firms available for that work divided by the total number of firms available for that contract element. Each firm in BBC's availability database identified as available for a particular contract element was assumed to have the same chance of being awarded that prime contract or subcontract as every other firm identified as available for that work.

The Monte Carlo simulation run repeats the above process for all other contract elements in the set. The output of a single Monte Carlo simulation for all contracts in the set represents simulated utilization of minority- and women-owned firms for that set of contract elements.

The Monte Carlo simulation is then repeated 1 million times for each set of contracts. The combined output from all 1 million simulation runs represents a probability distribution of the overall utilization of minority- and women-owned firms if contracts were awarded randomly based on the relative availability of Georgia firms working in relevant subindustries.

Out of 1 million simulation runs, zero (less than 0.1%) produced a result that was equal to or below the observed 4.2 percent MBE utilization identified for GDOT FHWA-funded contracts. The difference between utilization and availability for MBEs is statistically significant at the 95 percent confidence level.

Disparities for MBEs were also statistically significant for GDOT state-funded contracts as shown in Figure 7-8.

When examining disparities for WBEs on GDOT state-funded contracts, BBC's Monte Carlo analysis determined that the disparities were statistically significant.

Therefore, the disparities identified for MBEs and WBEs in GDOT contracts could not be easily replicated by chance in the procurement process.

Figure 7-8.
Statistical significance of disparities in overall MBE and WBE utilization on GDOT FHWA- and state-funded construction and engineering-related contracts, 2009–June 2011

MBE/WBE Group	Disparity index	Number of simulation runs out of one million that replicated observed utilization	Probability of observed disparity occurring due to "chance"	Reject chance in awards of contracts as a cause of disparity?
FHWA-funded contracts				
MBE	25	0	<0.1 %	Yes
WBE	173	N/A	N/A	N/A
State-funded contracts				
MBE	10	0	<0.1 %	Yes
WBE	50	8,109	0.8	Yes

Note: "N/A" means "not applicable" because utilization exceeded availability.
Utilization and availability includes non-DBE-certified firms.

Source: BBC Research & Consulting.

F. Summary

The disparity analysis indicates substantial underutilization of minority- and women-owned firms in GDOT contracts when the Federal DBE Program did not apply (GDOT's state-funded contracts). There were substantial disparities for each racial/ethnic/gender group — white women-owned firms and African American-, Asian-Pacific American-, Subcontinent Asian American-, Hispanic American- and Native American-owned businesses.

Even when the Federal DBE Program did apply (GDOT's FHWA-funded contracts), there were substantial disparities between the utilization and availability of African American-, Asian-Pacific American- and Subcontinent Asian American-owned firms.

BBC was also able to examine 14 local agency construction contracts within the study period (predominantly FHWA-funded contracts). Results by racial/ethnic/gender group were similar to those for GDOT FHWA-funded contracts, although overall disparities for MBE/WBEs were greater on local agency contracts.

Using additional disparity analyses and other research, Chapter 8 of the report further explores why disparities may be occurring in GDOT contracts.